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Light (anti-)nuclei production from nonlocal many-body scatterings in high-energy nuclear collisions

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Understanding light (anti-)nuclei production mechanism is a long-standing challenge in heavy-ion physics. Besides its own importance, it can benefit the search of QCD critical point as well as the detection of dark matter in space. In this presentation, we present a unified description of the microscopic dynamics of light (anti-)nuclei production in high-energy nuclear collisions by solving the relativistic kinetic equations with their nonlocal collision integrals treated with a stochastic method. With the effects of finite nuclei sizes included in the nonlocal collision integrals, this kinetic approach includes the statistical model, the coalescence model, and the conventional transport model for light nuclei production as limiting cases. The stochastic method is benchmarked in a box calculation, in which the thermal limits are correctly reproduced. Besides, our kinetic approach describes well the production of deuteron and helium-3 in both pp and heavy-ion collisions. The application of using light nuclei production to probe QCD critical point is further discussed.

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